to be desired (*e. g.*, Fig. 122). The new illustrations are largely from Government reports, but many photographs are by individuals, especially by the author. From these it appears that, since the publication of the first edition, the author has himself visited some of the important mining districts of the west, but in many cases it is evident he still does not possess sufficient familiarity with the regions to judge, from published reports of a given mining district, whether or not those of one author possess inherent merits entitling his views to superior consideration over those of another.

Professor Kemp, who is an excellent petrographer, has, as shown by his papers published elsewhere, a decided leaning toward the theory of magmatic separation of ore minerals held by Scandinavian geologists, like them, viewing the subject primarily from a petrographic standpoint. The sufficiency of this method for the formation of ore deposits, unless aided by later concentrations through the agency of circulating waters, is not, however, regarded with so much favor by most mining geologists of wide practical experience in America.

Taken as a whole the book presents an excellent bird's-eye view of the ore deposits of the country, as nearly up to date as is practicable, with a fair-minded presentation of the various views held as to their origin and mode of formation. The mining community is certainly indebted to Professor Kemp for the ability and thoroughness with which he has accomplished his laborious task, the magnitude of which few beside the author can adequately appreciate.

S. F. EMMONS.

The Nature and Work of Plants. An Introduction to the Study of Botany. By DANIEL TREMBLY MACDOUGAL, Ph.D., Director of the Laboratories, New York Botanical Garden. New York, The Macmillan Company. 1900. Pp. xviii + 218. 12mo.

The author's introductory paragraph gives us his point of view. "The course outlined in this little book is essentially a study of the functions or action of the plant, and organs are considered chiefly as instruments for the performance of work, with but little attention to their morphology. It is believed that this method of introduction to the subject of botany will be best suited for beginners who have not at hand the facilities of a laboratory. In conformity with this idea, the use of technical terms has been restricted to the actual necessities of logical treatment, and the demonstrations have been developed by the simplest experimental methods."

He takes up the subject in ten chapters, as follows: I. the composition and purposes of plants: II. the material of which plants are made up; III. the manner in which different kinds of work are divided among the members of the body; IV. the roots; V. the leaves; VI. stems; VII. the way in which new plants arise; VIII. seeds and fruits; IX. the power or energy of the plant; X. relations of plants to each other, and the place in which they live. These chapters include two hundred and fifty paragraphs, each of which directs attention to a single fact or group of facts, which in most cases may be subjected to observation or experiment by the pupil. Very simple suggestions are given for these observations and experiments, and the pupil is usually left quite free to use his own ingenuity in carrying them out. While function is emphasized, structure is not ignored, but this is almost entirely confined to gross structure, the author's intention being to require no greater aid to the naked eye than a hand lens magnifying from six to ten diameters.

The book is non-technical, in conformity to the trend of recent text-books, and is remarkable in having *no illustrations whatever*, the author depending upon the simplicity and clearness of his text and the plant or experiment itself to furnish ideas to the pupil. Whether the pupils and teachers who have been brought to expect fine 'half-tone' illustrations of everything from cell elements to plant communities, and a profusion of diagrams of physiological apparatus, with 'half-tones' showing the results of experiments, will take kindly to this book which implies and demands *work* on the part of both, remains to be seen. There is a good deal of laziness in the world, and we fear that the temptation to use a book with pictures (which too often are studied in lieu of the experiments) may be so strong as to

prevent the general use of Dr. MacDougal's book.

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De praktische toepassing van Stoomschuif- en Schaarbewegingen bij Stationaire, Locomobiel-, Locomotief- en Scheeps-machines door C. STEUERWALD; Mit eene voorede van H. A. RAVENEK. By W. S. AUCHINCLOSS. Leiden. A. W. Sijthoff. 1899. Pp. 108. Many illustrations.

This book is a translation, into the Dutch, of Auchincloss' well-known treatise on valve-motion, of which a German version has long been in type. The translator is a member of the Faculty of the Polytechnic School of Delft; the introduction is written by Professor Ravenek of the same institution. There is no lack of such works in the English, German and French languages; but the work of Auchincloss excels in the simple and very clear manner in which the graphical constructions are made, "without preceding calculations, simply by outlines on the drawing-board," as Professor Ravenek says in his introduction. The treatise is adjudged 'very suitable to be placed in the hands of apprentices and draughtsmen' as well as of students in mechanical engineering.

The British measures of the original are replaced in the translation by metric.

This reproduction of the American work in Dutch is one of the most gratifying testimonials to the value of the work which has yet appeared. The book is unusually well-printed and its illustrations are exceptionally well-made.

R. H. T.

Mesure des température élevées. Par. H. LE CHATELIER et O. BOUDOUARD. Paris, G. Carré et C. Naud. 1900. Pp. 1–220.

In these few pages Le Chatelier and his assistant have given a terse and useful account of the principal methods of cotemporaneous pyrometry. Measurement of high temperature has, as a rule, referred to the comparison of different temperature functions, and the results obtained have therefore differed enormously. The confusion has gradually subsided however, in proportion as the air thermometry of high temperatures has been more fully mastered. Le Chatelier makes a judicious selection of standard temperatures in the introductory chapters of his book and estimates the probable error to be 1° between 200° and 500°, 5° between 500° and 800°, 10° between 800° and 1100° and upwards 50° above 1100°. In the list of pyrometers which follows I should have referred the calorimetric pyrometer to Pouillet and perhaps included the viscosity pyrometer.

The brief account given of normal temperatures as defined by Kelvin and their relation to the air thermometer is intelligible, well digested and practical in character, though these corrections at high temperatures are of small moment. An account is also given of the standard (hydrogen) air thermometer of the Bureau International at Sèvres, which may be taken as a preliminary model, since the normal air thermometer for high temperatures has not yet been constructed. The authors might have added that very definite steps are being taken in this direction by Holborn and Day at the Reichsanstalt. It has been shown that the platinum-iridium alloy is impervious to nitrogen rigid up to the highest industrial temperatures. Nothing now stands in the way to prevent high temperature measurements from attaining the full precision of low temperature measurements.

The errors usually encountered in high temperature thermometry make up Chapter III. of the book, after which various historical pyrometers are described from figures, and critically discussed. It is interesting to note that the errors of Pouillet were largely due to the high value of the coefficient of expansion then in vogue. Among the whole series the interferential pyrometer of D. Berthelot may be singled out as being peculiarly promising, both on account of the simple and apparently correct principle on which it is based, and on account of its indefinitely high temperature limit of application.

In preference to platinum which is expensive and iron which behaves anomalously, nickel has been recently proposed for calorimetric pyrometry. The authors give a series of appropriate data, and figures of available apparatus, together with the probable inaccuracies of this